WHAT IS CLAIMED IS:

1. A method of improving cardiac function in a patient with heart failure without eliciting an immune response and without sacrificing the patient's skeletal muscle; which comprises the step of transplanting autologous bone marrow stroma cells (MSCs) into said patient's myocardium to grow new muscle fibers.

2. The method of claim 1, which further comprises the step of using cell labeling technique to confirm survival and differentiation of implanted MSCs, and to identify said MSCs phenotype by both morphology and molecular markers.

3. The method of claim 1, which further comprises examining the effects of the micro-environment of implanted MSCs on their differentiation and phenotype expression.

4. The method of claim 1, which further comprises examining functional contribution of MSCs implanted into an ischemic segment of the myocardium.

Sub Cl 5. The method of claims 1 to 4, wherein said transplanting is effected in the myocardium *in situ*, in the myocardium artery or using a catheter from within the myocardium.

6. The method of claims 1 to 4, wherein said transplanting is effected in association with angiogenesis factors.

7. Use of autologous marrow stroma cells for improving cardiac function, wherein said autologous

marrow stem cells are introduced *in situ* into a myocardium.

8. The use as claimed in claim 7 wherein said marrow stroma cells differentiate into myocardial specific cell types in microenvironments within the myocardium.

9. The use as claimed in claim 8 wherein said marrow stroma cells differentiate in the microenvironments of the myocardium into cardiomyocytes, fibroblasts or endothelial cells.

10. The use according to claim 7 wherein said marrow stroma cells are delivered by selective infusion into the myocardium.

11. The use according to claim 10 wherein said selective infusion is intra-coronary delivery of the marrow stroma cells.

12. The use according to claim 8 wherein said marrow stroma cells are delivered to said microenvironments by coronary circulation.

13. A method of treating cardiac failure, said method comprising:

(a) retrieving bone marrow from a patient suffering from cardiac failure;

(b) isolating marrow stroma cells from said bone marrow;

(c) expanding said marrow stroma cells in culture; and

(d) transplanting said marrow stroma cells into a myocardium of said patient.

14. The method of claim 13 wherein said step of retrieving bone marrow includes performing a bone marrow puncture.

15. The method of claim 13 wherein said step of transplanting said marrow stroma cells into the myocardium includes selective infusion of said cells into coronary circulation.

16. The method of claim 13 wherein said step of transplanting said marrow stroma cells into the myocardium is achieved by transvenous catheter injection.

17. Use of autologous marrow stroma cells for examining the effects of a myocardial micro-environment on marrow stroma cell differentiation, wherein said autologous marrow stem cells are introduced *in situ* into an ischemic segment of a myocardium of an animal model.